UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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APR 15 1999

Mr. Kerry C. Gee
Vice President
United Park City Mines Company
PO Box 1450
Park City, UT 84060

Subject: Preliminary Hydrogeologic Review of Richardson Flats Tailings Site (March 23, 1999)

Dear Kerry:

EPA has completed an informal review of the subject document. The intent of the review was for EPA and the Utah Department of Environmental Quality to offer preliminary, general feedback on the validity of the document and its conclusions, as well as offering suggestions for future work. A detailed, programmatic review was beyond the scope of this review. Comments are presented below:

General Comments

- None of this work was performed with government oversight. While we assume the data to be valid for the purposes of this review, for obvious reasons it is important for future work to be "validated" through government oversight if the intent is to use it to support a government decision. As such, this review can only be considered informal.
- Weston has presented a variety of existing information on the area, which seemed to be generally consistent with the current work and conclusions. We have not performed a detailed search to determine of other information exists which may be helpful, nor have we examined the referenced reports in detail. For this review, we have assumed the references were used correctly and no other pertinent information exists (I currently know of none). Again, for this reason, the review must be considered informal.
- Many of the conclusions were based on one or two piezometer readings. It is important that the work continue if possible to aid in supporting the conclusions and increasing understanding of seasonal/yearly variations. It would be interesting to know if locations within the tailings such as RT-4 and RT-5 are always dry.
- The study was well planned and the report was well written. The information is beneficial. EPA tentatively agrees with the conceptual model presented, including the notion of the clay rich topsoil acting as an effective barrier to infiltration into, or out of, the tailings pile.
- It may be beneficial to perform water balances on the systems in question to validate/support the conclusions offered in the report. For instance, a water balance on the tailings pile (and ponded water), considering evaporation/transpiration, infiltration rates, precipitation, dike seepage, discharge to diversion ditches, etc. would be valuable in supporting many of the conclusions describing the pile's effect on its surroundings.

Similarly, determining the source and extent of flows within the diversion ditch would be valuable. While these estimations are often subject to significant error, they do offer valuable insight into the system and can validate other findings.

- We agree that further work is required to evaluate conditions within the impoundment. Based on the information presented, it is difficult to make any conclusions.

Specific Comments

- While we agree that seepage through the dike is likely very small, it is likely on the higher end of the estimates. The text states the main embankment was constructed of silty sand and gravel. Estimates in the literature for silty sand conductivities often range from 10^{-5} to 10^{-3} cm/s, which translates to 10-1000 feet/year. This is consistent with the "high end" estimate of 100 feet/year used in the report. The recent permeability tests were performed presumably on topsoil (as evidenced by the high clay content), and as such, may not reflect conditions in the dike (this was reflected in the conservative nature of Weston's estimates). Significant areas of gravel, or preferential pathways such as at interfaces, may increase flow through/around the dikes. This scenario is possible as evidenced by discrete seeps emanating from the toe and near the northern margin of the dike. Also, MW-5 has fairly consistently yielded higher dissolved zinc concentrations than neighboring wells, suggesting a local contamination source. Nonetheless, the estimates and rationale provided seem reasonable.
- It was difficult to test the validity of the arguments for evaporation and wetland consumptive use. It was unclear if factors such as seasonality were integrated. However, the approach of using a wide range of possibilities was sufficient to show the relative small contribution of tailings embankment seepage as calculated. The water balance in this area of the site is particularly important and should be developed further.
- Again, an attempt should be made to attribute flows in the diversion ditch to sources. The text states the ditch serves as a sink, implying most of its flow comes from "confined" aquifers trending flow to the north. However, UPDES monitoring has indicated elevated concentrations of metals in the ditch, suggesting contamination is making its way into the water. This may come from tailings the ditch is excavated into, or it may come from seepage through the southern dike, or both. The source of this contamination is an important consideration.
- The conclusion that the shallow aquifer(s) are under confined conditions is a bit strong. Taken over the entire study area, a better characterization would be semi-confined and variable. The geological nature of the area suggests localized conditions such as lenses and fluctuating gradients. Also, the "confining" layers are likely subject to some leakage. RT-4 being dry beneath the original topsoil is also troubling to this conclusion and particularly confusing.
- I am assuming that the "uncapped" area of the tailings pile roughly corresponds to the area of ponded water to the north. With no imported topsoil to act as a barrier to infiltration, one would assume that infiltration rates are higher in that area. Again, a water balance would be beneficial to estimate recharge to the tailings pile from that area and help determine if direct precipitation on the pile is the only source of recharge to the ponded area.

- I may be reading it wrong, but the discussion on RT-1 seems inconsistent with some of the conclusions. The data provided lends itself to various conclusions, including an unconfined unit, a perched unit, and various interpretations of head gradients. On pages 2 and 3 discussing E/E data, the text suggests an unconfined unit overlying a confining unit. No other mention is made of the possibility of unconfined conditions, except possibly near Silver Creek. The conclusion on page 9 regarding RT-1 states that there is downward gradient, which is inconsistent with the discussion on pages 2 and 3. At best, only the data from the new RT-1 supports that conclusion. Nonetheless, variability has been demonstrated.
- On Plate 1, the generalized groundwater flow direction near Silver Creek (within the inset and just below) is shown as being away from the creek towards the embankment. However, the text and conceptual model state that both Silver Creek and the diversion ditch act as hydraulic sinks. Also, the potentiometric surface in the piezometers near the creek (RT-7, RT-9) are very close to that of the creek, which apparently was measured on ice. Ice often tends to stay elevated above the true water level in spring. Also, the weak dilution effect observed from UPDES monitoring suggests water from the site vicinity is making it into the creek. Based on the data provided, I am unsure which direction(s) groundwater flows near the creek.

I hope this review proves beneficial to UPCM and we appreciate the opportunity to review the work. Please feel free to contact me at (303) 312-6897.

Sincerely,

Jim Christiansen
Remedial Project Manager

cc: Mo Slam, Utah Department of Environmental Quality